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NASA PROGRAM GEMINI WORKING PAPER NO. 5043

MISSION TRAINING PLAN FOR
GEMINI VIII FLIGHT CREW(NASA-TM-X-69923) MISSION TRAINING PLAN
FOR GEMINI 8 FLIGHT CREW (NASA) 19 p

N74-71224

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

January 10, 1966

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MISSION TRAINING PLAN FOR
GEMINI VIII FLIGHT CREW

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1.0 SUMMARY

This plan defines the training to be accomplished by the primary and backup crews in preparation for the sixth manned Gemini Mission (Gemini VIII). It is intended as a guide to the flight crews and support personnel responsible for training, and it does not represent absolute training requirements. The training outlined in this document is formal scheduled training, and it does not include such crew activities as study and physical fitness which are accomplished on an individual basis, nor those activities that are more directly related to flight operations support and engineering efforts.

The Crew Commander assisted by the Flight Crew Training Coordinator is responsible for the accomplishment of the overall training plan. Effective planning and coordination by all agencies involved will be essential to the successful completion of training objectives within the relatively short period available for training. Equipment location and availability will be such as to minimize crew and support personnel travel requirements.

2.0 INTRODUCTION

This training plan outlines the specific mission training to be accomplished by the flight crews for the manned Gemini VIII mission. Gemini VIII is the first spacecraft to fly with an auxillary tape memory (ATM) to operate in conjunction with the onboard computer and is the first mission to attempt extravehicular activity (EVA) during a rendezvous operation. This plan is published as a guide to the flight crew and the personnel responsible for training the flight crews.

The criteria used in developing this training plan are as follows:

1. Although crew members are normally scheduled by teams and in their designated seat positions, cross-seat and cross-team training will be done so that each crew member can satisfactorily perform the more critical tasks. This will permit some late-date flexibility in reassignment of the crew members and alleviate training schedule problems.
2. The backup crew must be as prepared for flight as the primary crew. This will permit, if the need arises, replacement as a team or by individual seat position with minimal delay to the launch schedule.
3. Only one crew member will be required to participate in the less critical activities, such as some of the spacecraft tests and certain systems and operations meetings. The crew member who attends will brief the others on the significant results.
4. The Gemini and Agena spacecraft test schedules are the basis for scheduling other crew training activities.
5. The crews will receive Gemini systems briefings prior to participation in major spacecraft tests, at the start of mission simulator training at Cape Kennedy, and again approximately 10 days before flight. They will also receive Agena systems briefings approximately 4 months before flight.
6. The Command Pilots assigned to Gemini VIII were thoroughly trained in basic spacecraft systems operations in preparation for the Gemini V mission; therefore, mission simulator sessions will include a review of basic systems rather than extensive basic systems training. Additional training sessions are planned for the pilots to provide systems familiarization prior to crew team training.
7. This training plan defines the equipment requirements only on a general basis. Detailed equipment requirements must be met by the responsible organizations to permit the training as described in this document.

8. The Crew Commander assisted by the Flight Crew Training Coordinator is responsible for accomplishment of the crew training activities. The training plan will be reviewed periodically by crew members and training personnel for progress and status of training.

3.0 PREPARATION AND TRAINING

The following is a description of each major area in which the crews will be extensively involved. Schedules defining specific areas of preparation and training are included in figure 4-2 to illustrate the proper sequencing of individual crew activities.

3.1 Spacecraft Tests

Participation by flight crew members in the testing of their spacecraft is of significant operational and training value to them. It is necessary to have an operator or observer inside the spacecraft during many of the tests. The flight crews will frequently fulfill this requirement for the major spacecraft tests and, in so doing, learn the characteristic functioning of their spacecraft systems. In addition, when modifications to the spacecraft are considered or required, the crews will be able to make inputs with full knowledge of the situation.

Spacecraft tests are normally run on a 24-hour basis, requiring both crew teams to cover the critical crew-interface tests. One or two crew members can cover the less critical tests. When practical, all four crew members will attend the major spacecraft test reviews.

Crew participation in testing of the Gemini VIII spacecraft is shown in figure 4-2. Each crew member will spend between 40 and 50 hours in the spacecraft and a much greater amount of time observing, troubleshooting, and reviewing spacecraft status, as well as supporting spacecraft tests and launch operations for other missions. The following outlines the planned number of crew members participating in the spacecraft testing and the location of these tests.

3.1.1 Gemini VI.-

<u>Test</u>	<u>Crew</u>	<u>Location</u>
Simultaneous Launch Demonstration	4	MSC
Final Simulated Flight	2	MSC

3.1.2 Gemini VIII.-

<u>Test</u>	<u>Crew</u>	<u>Location</u>
System Assurance Test	4	St. Louis
Simulated Flight Test	4	St. Louis

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<u>Test</u>	<u>Crew</u>	<u>Location</u>
Altitude Chamber Test and Horizontal SEDR	4	St. Louis
Plan X	4	Cape
Premate Verification	2	Cape
Premate Simulated Flight Test	4	Cape
Mate	4	Cape
Environmental, Electrical and Joint Guidance and Control Test	4	Cape
Joint Combined Systems Test	4	Cape
Final Spacecraft Systems Test	4	Cape
Final Simulated Flight Test	4	Cape
Simultaneous Launch Demonstration	4	Cape
Final Launch Preparation	2	Cape

3.2 Gemini Mission Simulator Training

The flight crew will complete an extensive training program using the Gemini Mission Simulators to provide them with experience in the normal and abnormal operation of spacecraft systems and flight control. The program consists of 30 training sessions, of 1 hour and 30 minutes to 3 hours duration. This training is divided into four training phases:

- a. Phase I - Familiarization
- b. Phase II - General Systems Training
- c. Phase III - Mission Training
- d. Phase IV - Network Simulations

Phases I and II will be conducted at the Manned Spacecraft Center. Most of Phase III and all of Phase IV training will be conducted at Cape Kennedy.

The Gemini Mission Simulator along with the Gemini Part Task Trainer will be used for out-the-window vehicle positioning and control, simulating both the day and night side orbit lighting situations. The tasks to be performed using the external displays are: (1) orientation of the vehicle to various positions from random initial attitudes, (2) practice estimating vehicle rates using celestial and terrestrial information, and (3) practice applicable flight plan maneuvers and tests, including the rendezvous maneuvers. This document contains only an outline of the mission simulator program. A detailed description of each session will be distributed on a limited basis to crew members and personnel directly involved in Gemini Mission Simulator training.

Each simulator training session will include a briefing and a debriefing. Sessions may be modified as required by such factors as status of simulation programs, equipment, and the assessed value of individual sessions.

3.2.1 Phase I - Familiarization.- The purpose of this phase is to familiarize the crews with the simulator configuration, the normal operational characteristics of the spacecraft systems, and the preliminary flight plan. The pilot crew members of Gemini VIII will receive additional familiarization sessions as required to become thoroughly proficient in spacecraft systems knowledge and operation. It is anticipated that each pilot will require approximately five additional familiarization sessions.

Session 1 - Simulator familiarization and general spacecraft systems operation.

Sessions 2 and 3 - Flight plan review with emphasis on operations using the visual display system. The crews will wear pressure suits during one of these exercises.

3.2.2 Phase II - General systems training.- The purpose of this phase is to train the crews in system failure detection for Gemini VIII spacecraft and analysis and the application of alternate procedures and operational modes. The application of specific mission rules is minimized. The number of failures per session will be kept to a level that will allow the crews to discuss and analyze each failure in detail. The sessions in this phase are:

Session 1 - Electrical sequential, electrical power and communications

Session 2 - ACME, OAMS, and RCS

Session 3 - Navigation and control

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Session 4 - Environmental control system (suited)

Session 5 - Random system failures

3.2.3 Phase III - Mission training.- This phase consists of 14 training sessions and its purpose is to refine each crew member's capability to perform specific mission duties. The rendezvous mission sessions in this phase will consist of a launch, rendezvous, retrofires, and a reentry. Random failures will be inserted that normally will not require early termination of the mission. The normal mission sessions will consist of major flight plan activities, including rendezvous, practiced on a real-time basis with random failures. The sessions comprising this phase are:

Session 1 - Launch aborts

Session 2 - Rendezvous

Session 3 - Rendezvous

Session 4 - Rendezvous mission

Session 5 - Normal mission

Session 6 - Launch aborts (suited)

Session 7 - Retrofires and reentries (suited)

Session 8 - Rendezvous mission (suited)

Session 9 - Normal mission (suited)

Session 10 - Launch aborts (suited)

Session 11 - Retrofires and reentries

Session 12 - Rendezvous mission (suited)

Session 13 - Normal mission (suited)

Session 14 - Normal mission (suited)

3.2.4 Phase IV - Mission simulations with mission control.- During the final phase of training on the mission simulator a series of integrated exercises will be conducted that will involve the flight crews and ground network support personnel. During these exercises, flight control is rehearsed exactly as it is planned for the mission. The crews will

occupy their positions in the mission simulator and will be in voice contact with either a real or simulated flight control network. Command and telemetry data links will also be active between the simulator and the flight control network. The types of exercises planned are launch, reentry, network, and simulated network simulations. The latter two are programed to cover countdown through rendezvous to simulate the worldwide network and flight controllers activities. During the network simulations or the simulated network simulations, the crews will have the option of remaining in the trainer and practicing flight plan activities with the network personnel.

The mission simulations currently planned together with mission control are as follows:

- Session 1 - Simulated network simulation
- Session 2 - Launch simulation
- Session 3 - Reentry simulation
- Session 4 - Simulated network simulation
- Session 5 - Simulated network simulation
- Session 6 - Simulated network simulation
- Session 7 - Reentry simulation
- Session 8 - Launch simulation
- Session 9 - Network simulation
- Session 10 - Network simulation

3.3 Translation and Docking Training

This training will be conducted on the Gemini Translation and Docking Simulator at MSC. The simulator is designed to provide crew training in spacecraft control during the docking phase, using all control modes, a wide variety of initial conditions, different lighting environments, and a moderate number of failures.

Training will consist of eight sessions of approximately 2 hours each. The first session is planned to allow the crews to become familiar with the trainer and with normal and abnormal control characteristics. The remaining seven sessions are planned to train the crews in maneuvering

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the spacecraft in close proximity of the target vehicle and successfully accomplishing the docking task. Various failures will be inserted during the runs. A detailed description of each session will be distributed to those personnel and crew members who are directly involved in training on the Translation and Docking Simulator.

3.4 Launch Abort Training

In addition to similar training on the mission simulator, the crew will receive launch abort training on the Dynamic Crew Procedures Simulator. This training program consists of eight different groups of runs, as listed below, to be accomplished in six sessions of approximately 25 runs per session. Where possible, they have been patterned after actual Titan launches.

Group I - Normal launch with minor deviations due to winds, transients, high or low booster thrust, et cetera.

Group II - Engine/propulsion failures.

Group III - Staging/sequential failures.

Group IV - Tank pressurization failures.

Group V - Controls/hydraulics failures.

Group VI - Instrument failures.

Group VII - Electrical/ordnance failures.

Group VIII - Selected double failures.

3.5 Egress and Recovery Training

The flight crews will receive spacecraft postlanding and recovery training in the Gulf of Mexico and pad emergency egress training at Cape Kennedy.

The postlanding and recovery training in the Gulf of Mexico will utilize as egress trainers Static Article No. 5 and Boilerplate No. 201. Prior to the operation the crews will receive a demonstration of the survival equipment to be carried on the mission. During the training exercise, the crews will practice postlanding systems operations, surface egress, and helicopter pickup. Each crew team will make two suited egresses from the egress trainers to include deployment and use of the survival pack equipment.

Emergency pad egress training using the elevator and the slide wire will be conducted at Cape Kennedy approximately 20 days before flight. The training consists of briefing on the procedures to be followed in using either the elevator mode or the slide wire mode plus a series of practice egress runs. At this time the crews will also receive a briefing and demonstration on the configuration and operation of the ejection system.

3.6 Celestial Training

The crew members will further increase their capability to orient and control the spacecraft by the use of celestial information, as well as make various astronomical observations, through the use of the Morehead Planetarium, Chapel Hill, North Carolina, and the Gemini Mission Simulator and Gemini Part Task Trainer incorporating the out-the-window optical display.

3.6.1 Planetarium reviews.- The flight crews will utilize the Morehead Planetarium for general celestial reviews and orientation. The crew will complete two sessions during each of three or four visits. The activities included in these reviews are as follows:

Session 1 - Review of entire celestial sphere which includes recognition of relative magnitudes, positions, distances and celestial coordinates of prominent stars and constellations.

Session 2 - This session is the same as Session 1 with more emphasis on reviewing stars and constellations near the orbital plane. The flight crew will observe and identify constellations and star patterns as they drift across the window using the Gemini Flight Plan and star charts for reference. The orbital conditions and the window viewing limits for both pilots will be simulated.

3.7 Extravehicular Activities Training

3.7.1 Briefings.- Prior to each of the following activities, the crews will receive a suitable briefing on the operation and limitations of the particular training device.

3.7.2 Beta Simulator.- Each pilot will practice extravehicular maneuvering for approximately 15 hours on the Beta Simulator (air bearing platform). This training will be suited and will include familiarization with the hand-held maneuvering unit (HHMU), tether dynamics, and the minimum reaction power tool (Experiment D-16).

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3.7.3 Gemini Crew Station and Adapter Mockup.- Prior to training in the altitude chamber and the zero "g" aircraft each pilot and command pilot will utilize the Gemini Crew Station and Adapter Mockups in pressurized suits to become thoroughly familiar with the physical handling and operation of the Extravehicular Life Support System (ELSS), Extravehicular Support Package (ESP) and associated connections.

3.7.4 Boilerplate No. 2 in Altitude Chamber.- Each crew will utilize the MSC altitude chamber to become familiar with depressurization and repressurization procedures, ELSS handling and operation, and egress and ingress procedures.

3.7.5 Zero "g" Flights.- During approximately eight flights in the KC-135 aircraft with the zero "g" spacecraft and adapter mockup, each crew will practice donning, doffing, and operating the ELSS, opening and closing the hatch, egress and ingress, and removal and operation of the HHMU and ESP. In addition, the crew will practice procedures and operation of micrometeorite collection (S-10) and power tool evaluation (D-16) experiments.

3.7.6 Spacecraft Systems Tests.- The crews will participate in Environmental Control System (ECS) and ELSS checkouts at McDonnell Aircraft Corporation.

3.8 Gemini Crew Station Mockup

The Gemini crew station mockup which duplicates the Gemini spacecraft internal geometry, in addition to the use for EVA training mentioned previously, will be used by the flight crews to establish cockpit stowage provisions, pressure suit and ejection seat interfaces, and use of special operational equipment. The advantages afforded by this mockup are early availability and stowage flexibility. The flight crews will use this trainer for a stowage review prior to the MAC Horizontal SEDR Test and as required during later training.

3.9 Briefings and Meetings

The three major areas of briefings (excluding those briefings and debriefings carried out in conjunction with training exercises on the simulators) are the flight plan reviews, spacecraft systems briefings, and flight experiments briefings.

3.9.1 Flight Plan Reviews.- The flight plan will be reviewed with the flight crews on an "as required" basis. The first review will be conducted shortly after crew selection and before commencement of their preflight training program.

3.9.2 Systems Briefings.- The flight crews will receive a series of briefings covering each major spacecraft system at the beginning of crew participation in spacecraft testing, and later at Cape Kennedy approximately 6 weeks before flight. A final systems review will be held approximately 10 days prior to flight at Cape Kennedy. In all cases the briefings will be given by the engineers involved in spacecraft testing. Each system will be discussed in detail with emphasis on operational techniques and functional interrelationships.

3.9.3 Flight Experiments.- The experiments for this mission will be reviewed in general with the flight crews at the beginning of specific mission training, approximately 4 months prior to flight. These briefings will be given by the experimenters, experiment monitors and Flight Experiments Section personnel, emphasizing the experimental objectives and associated crew procedures. Experiments will be reviewed again at approximately 7 weeks and 2 weeks prior to flight to cover latest status and modifications to equipment and procedures. The Crew Station Mockup will be used early in the training period to develop proficiency in the manipulation and stowage of experimental equipment. The Gemini Mission Simulator will be used for operational crew training on experiments during the specific mission training period.

3.10 Other Training Activities

3.10.1 McDonnell Aircraft Corporation (MAC) Rendezvous Engineering Simulator.- The McDonnell rendezvous engineering simulations at St. Louis will be used by the crew for early familiarization with rendezvous techniques and procedures. Crew participation in these simulations will generally be scheduled between spacecraft tests at MAC St. Louis, and prior to availability of the Gemini Mission Simulation.

3.10.2 Part Task Trainer.- The Gemini Part Task Trainer will be used as required for practice of techniques and procedures used during the terminal phase of rendezvous and docking.

3.10.3 Aircraft Flying.- To the extent possible, crew travel in support of engineering and training activities will be via NASA aircraft. This will expedite crew travel and will maintain crew member flying skills. Frequently, experiments training equipment can be utilized during these flights.

3.10.4 Gemini VI and Gemini VII Missions.- The crews will participate in the Gemini VI and Gemini VII launch operations and postflight debriefings.

4.0 FIGURES

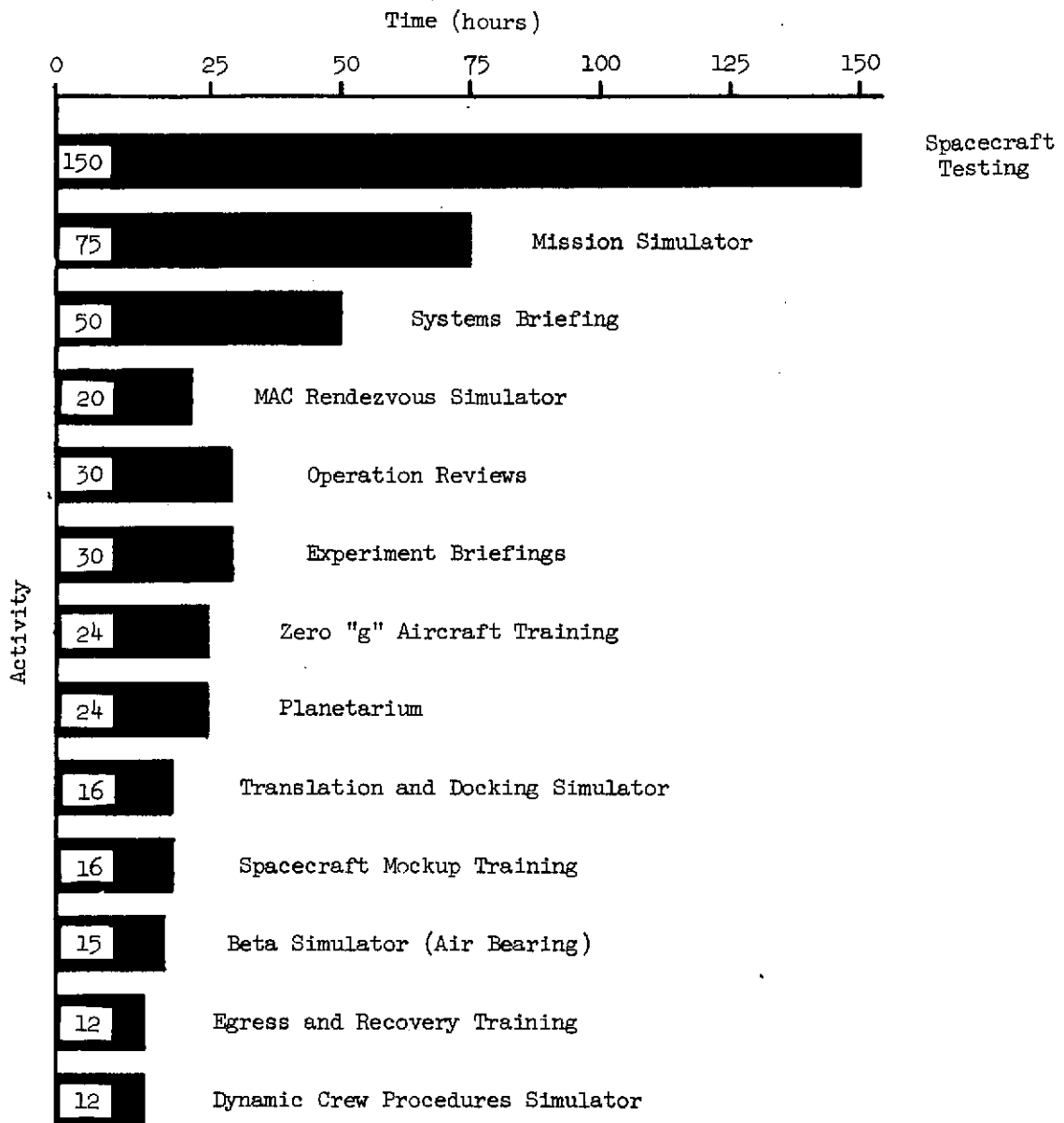


Figure 4-1.- Time spent by each crew member on training or related activities during preflight training period.

WEEKS BEFORE GEMINI VIII FLIGHT DATE

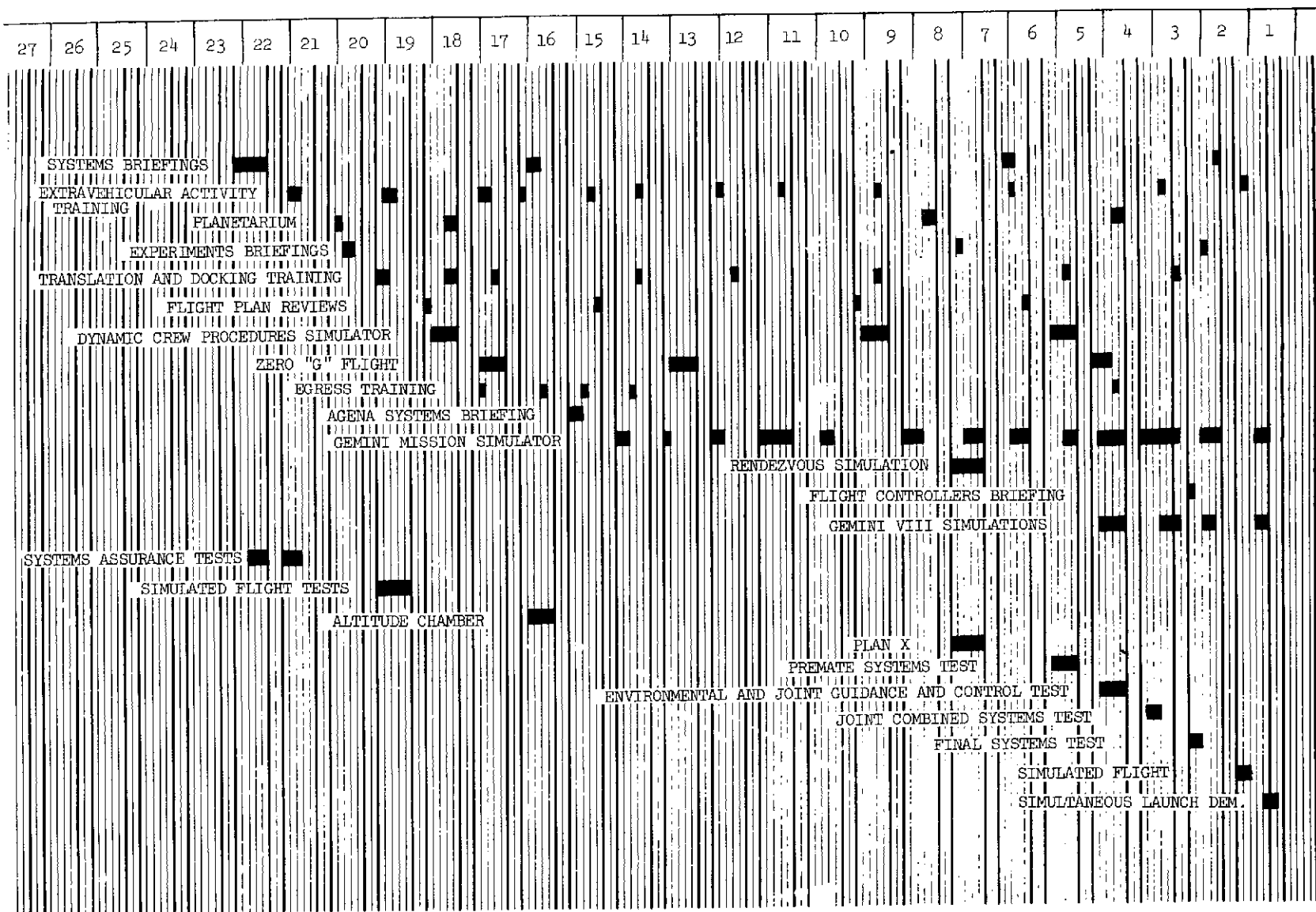


Figure 4-2.- Crew training schedule.